

REMARKS

This amendment is being filed in response to the Office Action having a mailing date of July 10, 2007. Various claims are amended as shown. No new matter has been added. Claims 19, 44, and 56-57 are canceled herein without prejudice. With this amendment, claims 1-18, 20-43, 45-55, and 58-62 are pending in the application.

I. Preliminary matters

The present Office Action objected to claim 47 due to a dependency issue. Claim 47 has been amended as shown to be dependent on claim 26, thereby overcoming the objection.

Claims 51-57 were rejected under 35 U.S.C. § 101 for allegedly using improper language. Independent claim 51 is amended as shown in a manner consistent with the suggested language provided by the Examiner, for which the applicants thank the Examiner. In view of these amendments, it is kindly requested that the rejection of claims 51-55 under 35 U.S.C. § 101 be withdrawn. Various other amendments are made to claims 51-55 to make their recitations consistent with the amendments above to claim 51 and/or to otherwise place such claims in better form. Claims 56-57 are canceled herein without prejudice, thereby rendering moot any rejection of these claims.

The present Office Action rejected claims 20 and 45 under 35 U.S.C. § 112, second paragraph, for being indefinite by not defining the variable “t.” Claims 20 and 45 are amended as shown to address this indefiniteness rejection, and also further amended to change their claim dependency.

The title of the application is amended as shown to make a typographical correction.

II. Discussion of the claims and cited references

The present Office Action rejected claims 1-10, 13-15, 19, 21, 23, 24, 26-35, 38-40, 44, 46, 48, 49, 51-60, and 62 under 35 U.S.C. § 103(a) as being unpatentable over Cho (U.S. Patent No. 6,463,100) in view of Maeda (U.S. Patent No. 5,341,441). The present Office Action rejected claims 11, 12, 36, 37, and 61 under 35 U.S.C. § 103(a) as being unpatentable over Cho and Maeda and further in view of Lee (U.S. Patent No. 5,731,836). Claims 16-18, 20, 22, 25,

41-43, 45, 47, and 50 were indicated to be allowable if rewritten in independent form, for which the applicants thank the Examiner.

For the reasons set forth below, it is kindly requested that the rejection of the specific claims still pending be reconsidered and withdrawn.

A. Discussion of independent claim 1

Independent claim 1 is amended as shown to include some language from its former dependent claim 19 (with claim 19 now canceled without prejudice) and to include other language. Specifically, claim 1 as amended recites, *inter alia*, that obtaining the vector quantization includes:

“identifying a sharpness value of edges in each of said blocks of pixels, and quantizing said sharpness value to divide the edges into a number of classes; and

attributing a value to said quantization step differentiated according to the classes, wherein the value of the quantization step is increased near the edges of said images having said pixels.”

It is respectfully submitted that none of the cited references, whether singly or in combination meet these limitations.

For example, page 3 of the present Office Action admitted that “Cho is silent on the specific operation of the quantizer.” Clearly for example, Cho does not identify the sharpness value of edges and does not quantize the sharpness value to divide the edges into a number of classes, such as recited in claim 1. As disclosed in the present application for one embodiment, after the sharpness of the edges between the pixels has been calculated, the sharpness is quantized so as to divide the edges into a number of classes. For example, the class 0 might correspond to the least sharp edge (*e.g.*, the diagonal $x_1=x_2$), the class 3 corresponds to the sharpest edge (*e.g.*, the upper-left and lower-right corners). The quantization step of the pixels of the block is chosen the higher, the sharper is the edge.

Further, Cho does not disclose, teach, or suggest a method where the value of the quantization step is increased near the edges of the images, as recited in amended claim 1. For instance and as disclosed in the present application for one embodiment, vector quantization is used in which images are quantized in a coarser manner near the edges, where high frequencies

are found. In effect, the quantization step can be the greater, the sharper the edge. In contrast, Cho discloses the following in his column 10, lines 25-48 (emphasis ours):

“The bits may further be saved utilizing the fact that the sight of human are sensitive and deteriorates for image quality in a very bright or dark place. A method for finding a macro block masked by brightness (BM), as shown in FIGS. 16(a) and (b), is based upon the average of luminance of every pixels in the current macro block. The macro block with an average luminance smaller than L0 or greater than L1 and is selected as an insensitive portion to the naked eyes and can be quantized coarsely. The values L0 and L1 are constants determined experimentally and in the preferred embodiment, L0 is 64 and L1 is 192.

For quantization of a selected macro block, the calculated value of $mquant_j$ would be doubled. The process may be summed up as follows and can be expressed by Equation 15 below.

1) Calculation of average luminance L_{avg} of the current macro block

2) Regulation of $mquant_j$

$2 * mquant_j$ if $L_{avg} > L0$ or $L_{avg} < L1$ $mquant_j = mquant_j$ otherwise

[Equation 15]

Bits are much saved for blocks having dark or bright areas and quantized finely for other areas, enhancing the subjective image quality.”

From the above-cited passages of Cho, it is evident that Cho performs coarse quantizing based on whether an average luminance is smaller than L0 and greater than L1, so that “bits are much saved for blocks having dark or bright areas and quantized finely for other areas.” In comparison, claim 1 clarifies that coarse quantization (increased quantization step) is performed near the edges of the images.

Accordingly, claim 1 is allowable over Cho.

It is respectfully submitted that claim 1 is also allowable over Maeda, whether singly or in combination with Cho.

First, Maeda is completely silent as to “the value of the quantization step is increased near the edges of said images” as recited in claim 1.

Furthermore, claim 1 recites “said vector quantization from repeated application of a scalar quantizer to the pixels of said blocks.” In other words, the vector quantization is performed on the pixels, without any sort of prior transformation of the pixels. In contrast, Maeda performs his vector quantization on Hadamard-transformed points. Specifically, Maeda discloses the following in his column 7, lines 8-20 and column 10, lines 1-20 (emphasis ours):

“A Hadamard transform used in the present invention will now be described. This Hadamard transform is a form of orthogonal transform, which is particularly well suited as a method of vector quantization preprocessing. This Hadamard transform is common to the embodiments described hereinbelow.

As an illustrative example, assume that the image to be coded is a black-and-white multivalued image, and that each pixel is composed of eight bits. The Hadamard transform is applied to blocks composed of 4 x 4 pixels, as shown for example in FIG. 20A. Here x_{ij} ($i=1 \dots 4, j=1 \dots 4$) represents a pixel of the image.

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In a case where the image data has been orthogonally transformed, the positions of sequency components (Y_{ij}) (FIG. 2) having large values in a block change depending upon the image characteristics. For example, in case of image data having a steep edge in the vertical direction, a large sequency component (power) concentrates in the shaded portion shown in FIG. 4B. Similarly, a large sequency component concentrates in the shaded portion shown in FIG. 4C in case of image data having a steep edge in the horizontal direction of the image data, and a large sequency

component concentrates in the shaded portion shown in FIG. 4D in case of image data having a steep edge in the diagonal direction of the image data. In addition, power concentrates solely in the low-frequency portion, as shown in FIG. 4A, with regard to an image which does not contain an edge portion. In this embodiment, an inputted image block is sorted into one of these four classes and the blocks are independently vector-quantized, as shown in FIG. 4, thereby raising the efficiency of vector quantization.”

From the above, it is clear that Maeda performs his vector quantization on Hadamard-transformed image data. In contrast, claim 1 recites digital video signals having images organized in blocks of pixels and obtaining vector quantization from repeated application of a scalar quantizer to the pixels. Accordingly, since Maeda does not meet the limitations of claim 1, claim 1 is allowable.

B. Discussion of the other independent claims

Independent claims 26, 51, and 58 are amended to include some recitations generally along the same lines as those in amended claim 1 above. In particular, claims 26, 51, and 58 are amended to include some language from some of their respective dependent claims, with said dependent claims now canceled without prejudice.

For reasons previously set forth above in the discussion of independent claim 1, claims 26, 51, and 58 are allowable by way of analogy.

C. Discussion of other claim amendments

Various other amendments are made to the claims as shown to provide appropriate antecedent basis, to provide consistent terminology between the claims, to make typographical corrections, and/or to otherwise place such claims in better form.

III. Conclusion

Overall, none of the references singly or in any motivated combination disclose, teach, or suggest what is recited in the independent claims. Thus, given the above amendments and accompanying remarks, the independent claims are now in condition for allowance. The dependent claims that depend directly or indirectly on these independent claims are likewise allowable based on at least the same reasons and based on the recitations contained in each dependent claim.

If the applicants' attorney (Dennis M. de Guzman) has overlooked a teaching in any of the cited references that is relevant to the allowability of the claims, the Examiner is requested to specifically point out where such teaching may be found. Further, if there are any informalities or questions that can be addressed via telephone, the Examiner is encouraged to contact Mr. de Guzman at (206) 622-4900.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

All of the claims remaining in the application are believed to be allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

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